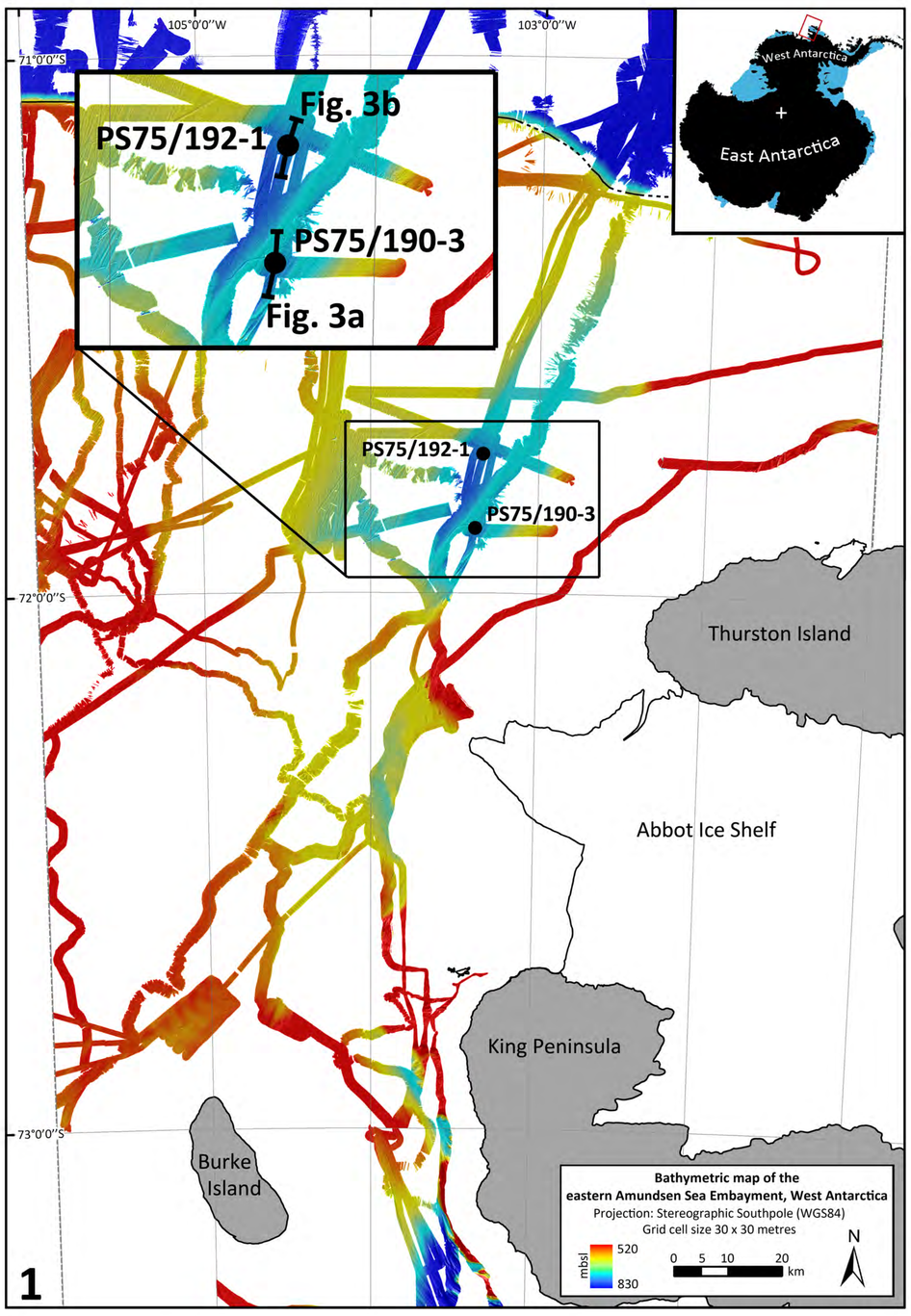
View metadata, citation and similar papers at core.ac.uk
brought to you by CORE
provided by Electronic Publication Information Centre

ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR- UND MEERESFORSCHUNG

A135

Klages, J.P., Kuhn, G., Hillenbrand, C.-D., Graham, A.G.C., Smith, J.A., Nitsche, F.O., Larter, R.D., Gohl, K., Wacker, L.

Assessing the extent of the West Antarctic Ice Sheet on the eastern Amundsen Sea shelf during the last glacial period



Bathymetry

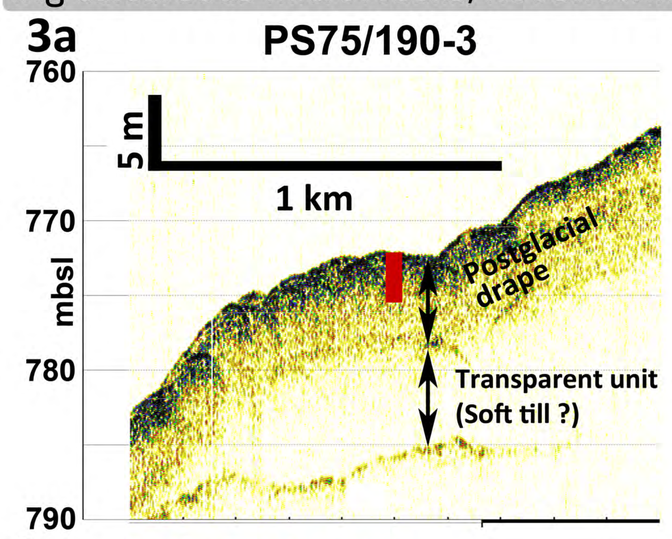
High-resolution swath bathymetry data collected during several research cruises over the past two decades reveal a palaeo-ice stream trough (Abbot Glacial Trough) crossing the middle and outer shelf of the easternmost Amundsen Sea Embayment (ASE; Figs. 1, 2), east of the main Pine Island Trough.

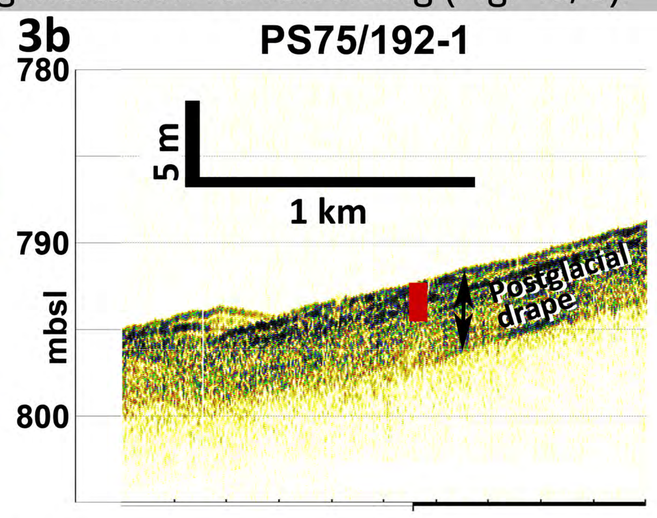
Glacial geomorphology

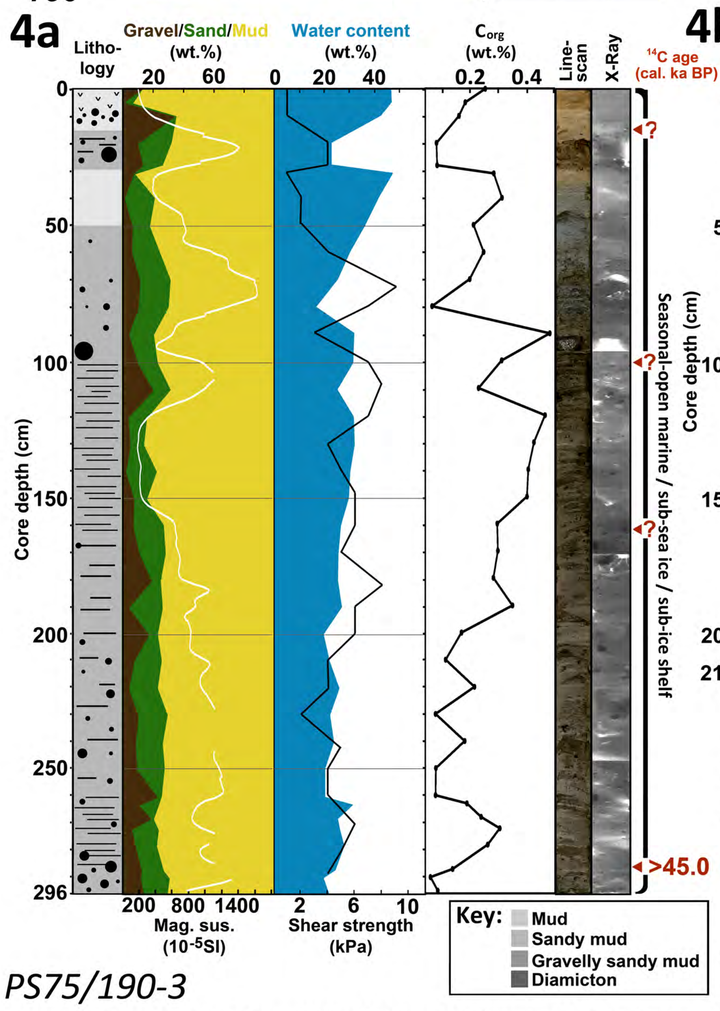
Regions of both fast palaeo-ice flow (within the central trough) and slow palaeo-ice flow (on adjacent seafloor highs referred to as inter-ice stream ridges) bear glacial landforms indicative of phases of grounding-line stabilization of the ice sheet (Fig. 2). Did the West Antarctic Ice Sheet cover the entire shelf during LGM?

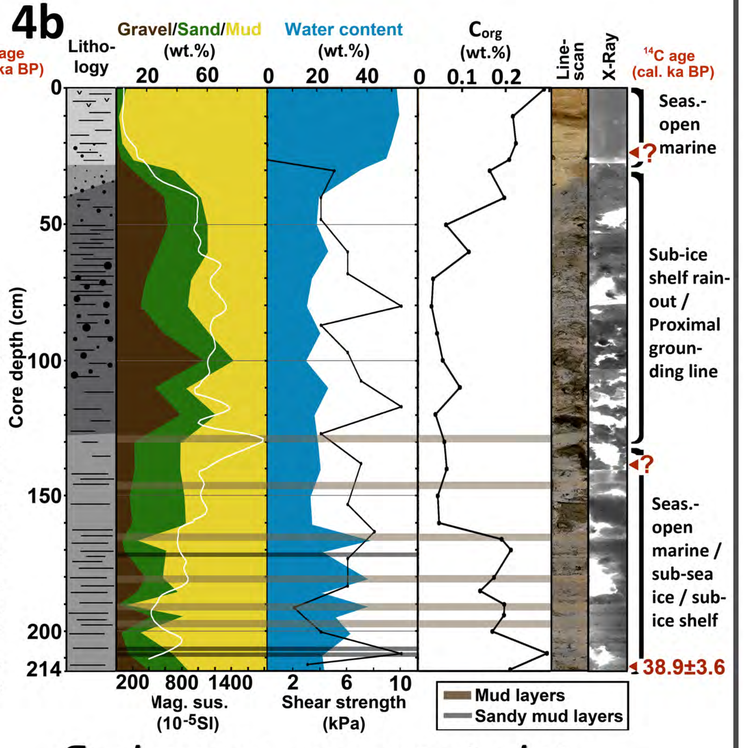
Sediment echography and sedimentology

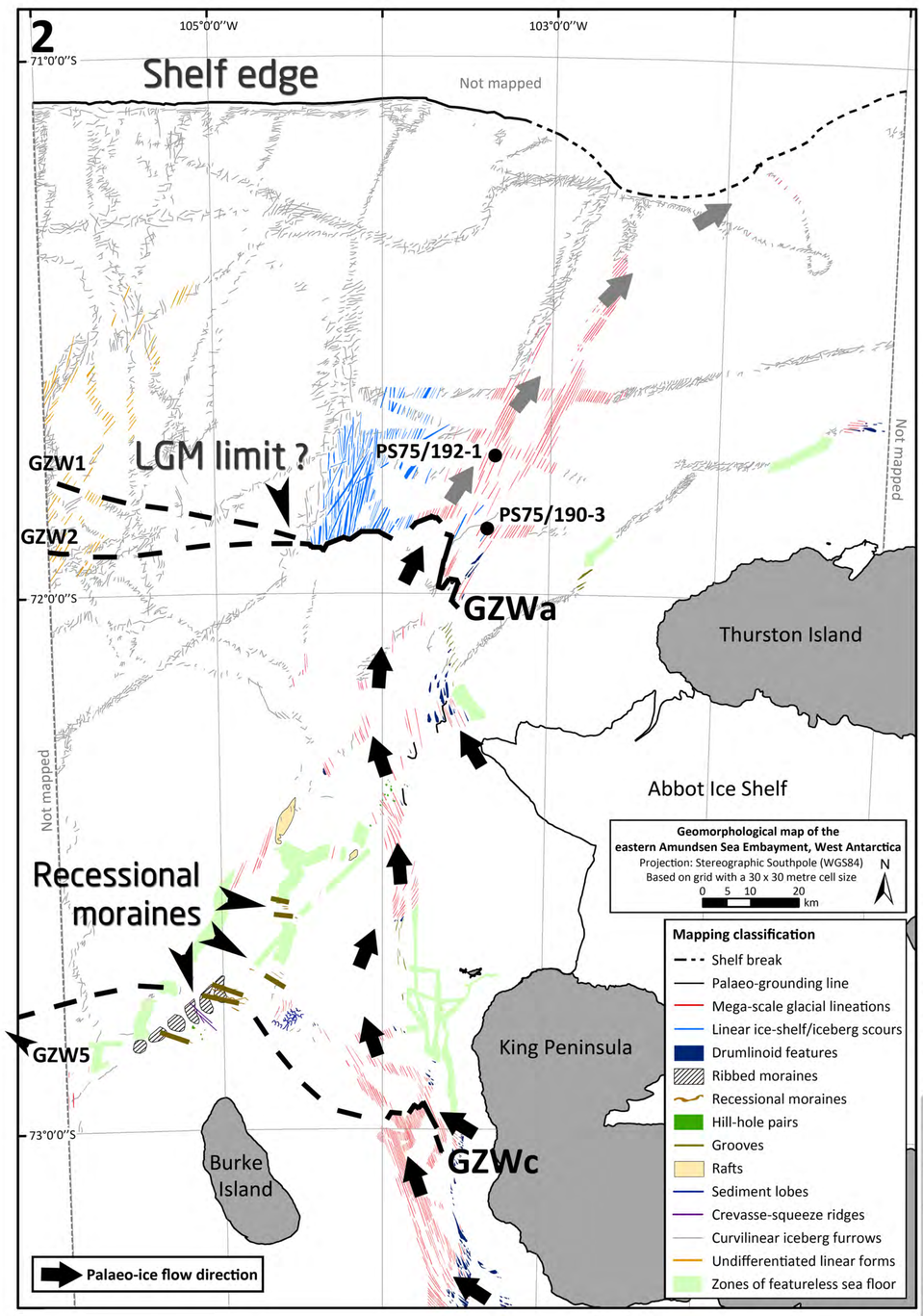
New sediment echosounder and sediment core data collected from outer Abbot Glacial Trough, between the seaward limit of the grounding-zone wedge and the shelf edge (Fig. 1), reveal an up to 6 m-thick well stratified drape (Fig. 3a, b) that is composed of unconsolidated glaciomarine sediments occasionally bearing calcareous microfossils, not showing indication for reworking (Fig. 4a, b).











Facies and age constraints

PS75/192-1

214-127 cmbsf: Stratified gravelly sandy mud, microfossil-bearing ➤ Seas.-open marine / sub-sea ice / sub-ice shelf, prominent (sandy) mud layers, age of mixed foraminifera from core base: ~39 cal. ka BP.

127-30 cmbsf: Stratified muddy diamicton, fining-upward top (Grav.-sandy mud)

30-0 cmbsf: Diatom-bearing stratif. mud

PS75/190-3

296 - 0 cmbsf: Stratified (sandy) mud, IRD & microfossil-bearing ➤ Seas.-open marine / sub-sea ice / sub-ice shelf, age of mixed foraminifera from core base: >45 cal. ka BP

Dating uncertainties and preliminary interpretation

- MICADAS dating on very small carbonate amounts (7-16 µg C) - high error bars!
- However, pre-LGM ages within upper part of stratified postglacial drape may suggest that outer eastern ASE shelf was not covered by grounded ice during LGM: limit GZWa?
- To confirm: Extended foram picking & dating, longer cores in order to penetrate drape

References:
Graham, A.G.C., et al., 2010. Flow and retreat of the Late Quaternary Pine Island-Thwaites palaeo-ice stream, West Antarctica. Journal of Geophysical Research 115.
Klages, J.P., et al., 2013. First geomorphological record and glacial history of an inter-ice stream ridge on the West Antarctic continental shelf. Quaternary Science Reviews 61, 47-61.
Klages, J.P., et al., in prep. Detailed palaeo-ice flow pathways in the easternmost Amundsen Sea Embayment, West Antarctica. To be submitted to Geomorphology.

British Antarctic Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL
UNIVERSITY OF EXETER
Lamont-Doherty Earth Observatory
COLUMBIA UNIVERSITY | EARTH INSTITUTE
ETH Zürich
ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR- UND MEERESFORSCHUNG
HELMHOLTZ GEMEINSCHAFT
Marine Geology and Paleontology
Am Alten Hafen 26
27568 Bremerhaven
Germany